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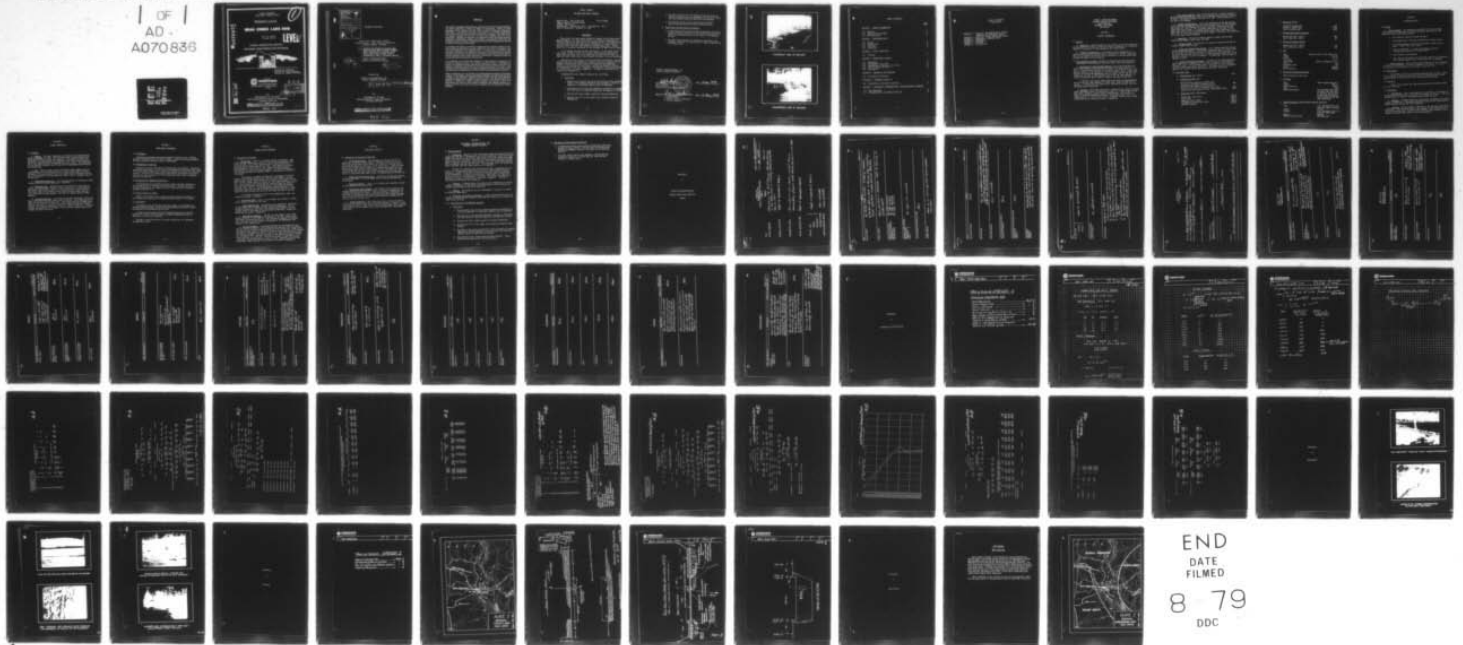
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NATIONAL DAM INSPECTION PROGRAM. BEAR CREEK LAKE DAM (NDI ID NU--ETC(U)  
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DACW31-79-C-0010

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DELAWARE RIVER BASIN  
BEAR CREEK, LUZERNE COUNTY

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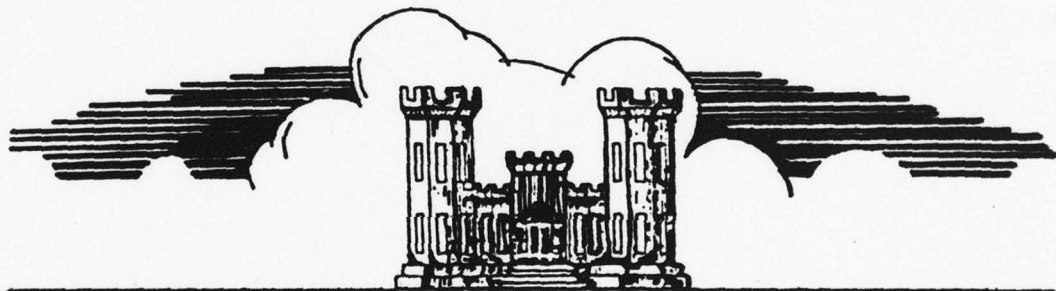
PENNSYLVANIA

# BEAR CREEK LAKE DAM

NDI-PA 00545  
PA DER 40-47

# LEVEL

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM



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Prepared By

**O'BRIEN & GERE**

Justin & Courtney Division  
PHILADELPHIA, PENNSYLVANIA  
19103

FOR

DEPARTMENT OF THE ARMY  
BALTIMORE DISTRICT CORPS OF ENGINEERS  
BALTIMORE, MARYLAND

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DELAWARE RIVER BASIN

Name of Dam: Bear Creek Lake Dam  
 County & State: Luzerne County, Pennsylvania  
 Inventory Number: PA 00545

(6) National Dam Inspection Program, Bear Creek Lake Dam (NDI ID Number PA-00545, DRR ID Number 40-47), Delaware River Basin, Bear Creek, Luzerne County, Pennsylvania, Phase I Inspection Report.

PHASE I INSPECTION REPORT  
 NATIONAL DAM INSPECTION PROGRAM

(11) Mar 79

(12) 66 P.

Prepared by:

O'BRIEN & GERE ENGINEERS, INC.  
 JUSTIN & COURTNEY DIVISION

(15) DATW 31-79-C-0010

For:

DEPARTMENT OF THE ARMY  
 Baltimore District, Corps of Engineers  
 Baltimore, MD 21203

ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE.

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## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



## PHASE I REPORT

### NATIONAL DAM SAFETY PROGRAM

Name of Dam: Bear Creek Lake ID # PA 00545  
County Located: Luzerne County  
Stream: Bear Creek  
Coordinates: Latitude 41 10.7'. Longitude 75 45.4'  
Date of Inspection: December 14, 1978

#### ASSESSMENT

Bear Creek Lake Dam, owned by Helen B. Daugert and the Bear Creek Realty Company, is a rock filled timber crib structure approximately 325 feet long and 17 feet high at its maximum section. An ungated drop spillway with an 158-foot long sharp crested weir is located approximately 60 feet from the right abutment (looking downstream). The 80 acre lake is used for recreation by the residents of Bear Creek Village.

It is unknown when the dam was constructed. In the state inspection report of April, 1915 it is stated, "This dam was constructed a great many years ago, but it has been repaired from time to time, so that more than likely none of the original structure is now in existence."

Examination of the results of the hydrologic and hydraulic analysis indicate that the drop spillway is capable of passing 11 percent of the Probable Maximum Flood (PMF) without overtopping of the embankment. Failure of the dam would significantly increase the hazard to loss of life downstream of the dam. Therefore, the capacity of the drop spillway is classified as "seriously inadequate." The dam is considered to be "unsafe (non-emergency)."

Recommendations and remedial measures are as follows:

#### a. Facilities

1. Because of the nature and age of the structure, the underwater areas of the cribbing should be investigated by a diver to determine if additional remedial work is necessary.
2. The capacity of the spillway should be increased in accordance with the results of detailed hydrologic and hydraulic studies.
3. Missing and rotten timbers should be replaced immediately.
4. Missing rock fill in the timber cribs should be replaced immediately.

5. The trees in the earth fill portion of the dam should be removed immediately and the embankment area where the trees have been removed should be backfilled and regraded.
6. The reservoir drain system should be made operable. Access should be provided to the sluice gate hoist.

b. Operational and Maintenance Procedures

1. A downstream warning system should be developed; and during periods of heavy rainfall, the dam should be monitored and downstream residents alerted in the event of an impending failure.
2. The owner should develop and implement a maintenance and inspection checklist to insure that all items are maintained on a regular basis.

O'BRIEN & GERE ENGINEERS, INC.  
JUSTIN & COURTNEY DIVISION

*Will M. Heiser*  
Will M. Heiser, P.E.  
Vice-President  
Pennsylvania Registration #006926-E



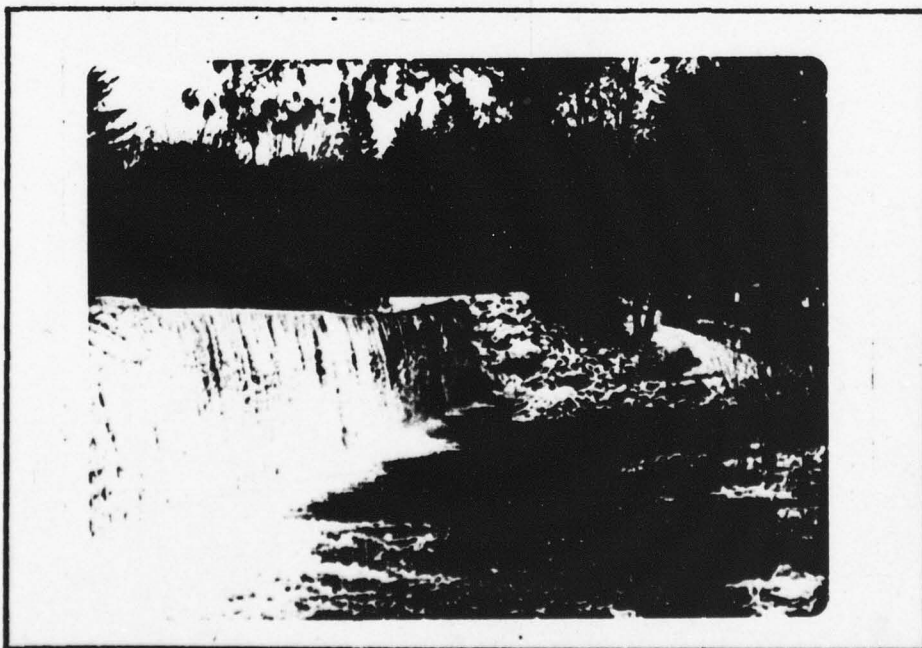
Date: 16 Apr. 1979

Approved by *G. K. Withers*  
G. K. WITHERS  
Colonel, Corps of Engineers  
District Engineer

Date: 14 May 1979



*UPSTREAM VIEW OF THE DAM*



*DOWNSTREAM VIEW OF THE DAM*



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PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
BEAR CREEK DAM  
NATIONAL ID PA-00545  
DER #40-47

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection. The purpose of this inspection is to evaluate the structural and hydraulic conditions of the Bear Creek Lake Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project (Information obtained from the Pennsylvania Department of Environmental Resources (DER), Dam Safety Section).

a. Description of Dam and Appurtenances. Bear Creek Lake Dam is a rock filled timber crib structure. The dam has a maximum height of 17 feet, is approximately 325 feet long and has a top width of 4 feet. The upstream slope is 4 horizontal to 1 vertical (4H:1V) with a timber plank facing; the downstream embankment slope on either side of the vertical timber weir section is approximately 1½H:1V and has trees growing in it with trunks more than 2 feet in diameter and over 50 feet tall.

A 158-foot long square edged timber weir begins at approximately 60 feet from the right abutment. A timber gate, used to drain the reservoir, is located 40 feet right of the left end of the weir with its sluiceway outlet boarded up.

b. Location. Bear Creek Lake Dam is located on Bear Creek at a point about 200 feet upstream of Pennsylvania route 115 in Bear Creek Village, Bear Creek Township, Luzerne County, Pennsylvania. The dam site is shown on the USGS Quadrangle entitled, "Wilkes-Barre East, PA.", at coordinates N 41 10.7', W 75 45.4'. A regional location plan of Bear Creek Lake Dam is enclosed at Plate 1, Appendix E.

c. Size Classification. Bear Creek Lake Dam has a storage volume of 250 million gallons (765 acre-feet) at the maximum operating pool elevation of 1524. The maximum height of the dam is 17 feet. The structure is in the small size category.

d. Hazard Classification. The valley downstream of the dam contains about 8 private residences within one and a quarter miles of the structure. The bridge for state highway 115 crosses over Bear Creek about 200 feet downstream from the dam. The topography downstream of the dam is such that flood waters would be directed towards these homes resulting in probable loss of lives and extensive property damage. Therefore, the structure is in the "high" hazard category.

e. Ownership. The dam is owned by Helen B. Daugert and the Bear Creek Realty Company, Bear Creek, PA 18602.

f. Purpose of Dam. The reservoir is used for recreation by the residents of Bear Creek Village.

g. Design and Construction History. It is unknown when the dam was designed and constructed. In the state inspection report of April, 1915, it is stated, "This dam was constructed a great many years ago, but it has been repaired from time to time, so that more than likely none of the original structure is now in existence." A footbridge, over the dam was removed in 1933.

h. Normal Operating Procedures. According to the USGS Quadrangle, Bear Creek, PA., it appears as if the lake is normally maintained at Elevation 1521.0. The sluiceway outlet is boarded up, which indicates that the timber gate may be inoperable. The owner was not available to operate the reservoir drain gate during the day of inspection.

### 1.3 Pertinent Data

a. <u>Drainage Area</u> (sq. miles)	35.2
b. <u>Discharge at Dam</u> (cfs).	
Gated Spillway capacity at normal pool (if gate is operable) elevation 1521.0	540
Gated Spillway capacity of maximum pool Top of Dam (if gate is operable) elev. 1524.0	675
Ungated Spillway capacity at top of dam elev. 1524.0	2790
c. <u>Elevation</u> (feet, USGS Datum)	
Normal pool, weir crest	1521.0
Top of dam	1524.0
Reservoir drain invert	1512.5
Streambed at centerline of dam	1507.0
Maximum Tailwater	1515.0



d. Reservoir (miles)

Length of maximum pool	0.90
Length of normal pool	0.85
Fetch at normal pool	0.65

e. Storage (Acre-Feet) Estimated

Normal pool Elev. 1521.0	490
Top of Dam Elev. 1524.0	765

f. Reservoir Surface (Acres)

Normal pool Elev. 1521.0	80
Top of Dam Elev. 1524.0	103

g. Dam

Type	Gravity, Rock Filled Timber Crib
Length	325 ft.
Height	17 ft.
Top width	4 ft.
Side Slopes	Refer to paragraph 1.2. a
Zoning	N/A
Impervious Core	N/A
Cutoff	Unknown
Grout Curtain	Unknown

h. Diversion & Regulating Tunnel

Does not apply to this site

i. Spillway

Type	Timber square edge weir
Length	158 ft.
Crest Elevation	1521.0
Gates	None
Downstream Channel	Flat bottomed creek channel about 150 feet wide at the dam; narrows down to about 45 feet wide at state highway bridge 200 feet downstream.

j. Regulating Outlet (Questionable whether operable)

Type	8 ft. horizontal by 6 ft. vertical timber sluiceway
Length	40 feet
Closure	8 ft. horizontal by 6 ft. vertical timber gate
Access	Unknown
Regulating Facilities	None Observed



SECTION 2  
ENGINEERING DATA

2.1 Design

a. Data Available. The information available for review of Bear Creek Lake Dam includes the following (information obtained from the Pennsylvania DER, Dam Safety Section):

1. Dam inspection reports through the years.
2. Photographs made in 1915 and through the subsequent years.
3. Four "Applications for Permit to Draw Dam or Other Body of Water," (1938, 1941, 1957, 1968).
4. Corps of Engineers, U.S. Army, Philadelphia District, "Disaster Work Survey Form," August 1955.
5. Miscellaneous correspondence
6. Two sheets of sketches of the dam with conflicting information. One is dated August, 1957, and the other one is undated.

b. Design Features. The principal design features for the structures are shown on the sketches enclosed in Appendix E as Plates 2, 3, and 4. A description of the features is discussed in Section 1.2.a.

2.2 Construction

The dam was originally constructed sometime prior to 1915. There are 3 pictures of repair construction in 1941 in DER files which shows reconstruction of the left end of the dam (looking downstream).

2.3 Operation

There is no evidence that operating procedures have been written for this structure.

2.4 Evaluation

a. Availability. Very limited material is available. The better of two available sketch sheets is enclosed in Appendix E as Plate 2. The most complete record is that of photographs made through the years.

b. Adequacy. Although design and construction information is minimal, a phase I evaluation is considered reasonable based on the revealing conditions observed during the field inspection.

c. Validity. The two sheets of sketches of the dam have conflicting information. The one dated August, 1957, appears to be consistent with the actual existing dam. Aside from the sketches, there appears to be no reason to question the validity of the data presented.

SECTION 3  
VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of the Bear Creek Lake Dam took place on December 14, 1978. The reservoir water surface elevation was approximately 1521.0 during the inspection. No underwater areas were inspected. The observations and comments of the field inspection team are in the checklist which is Appendix B of this report. The appearance of the facility indicates that the dam and its appurtenances are marginally maintained.

b. Dam. There are many rotten and missing timber members and considerable rock fill is missing from this rock filled timber structure. The earth fill downstream of the weir, on both sides of the weir section has trees growing in it with trunks more than 2 feet in diameter and over 50 feet tall.

c. Appurtenant Structures. The sluiceway outlet is boarded up, which indicates that the timber gate may be inoperable.

d. Reservoir Area. Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability, or other features that would significantly affect the storage capacity of the reservoir. The slopes along the perimeter of the reservoir which range from mild (less than 10%) to steep (greater than 30%) are almost entirely timber covered.

e. Downstream Channel. Approximately 200 feet downstream of the dam, Bear Creek flows under the state route 115 bridge. The bridge opening is about 10 feet high and 45 feet wide. The channel gradient averages about 0.4% for the entire 5.5 miles from the Bear Creek Lake Dam to the headwaters of the Corps of Engineers' Frances E. Walters Reservoir. There are 8 homes and approximately 40 people in the potential damage region which extends the entire 5.5 miles.

## SECTION 4

### OPERATIONAL PROCEDURES

#### 4.1 Procedures

Operational procedures have been covered in Section 1.2.h. Written operating procedures were not made available. Normal operating procedures for this structure would not require a dam tender.

#### 4.2 Maintenance of the Dam

Attempts to contact the owner of the dam were unsuccessful. The dam is marginally maintained. At the time of the inspection, there were many rotten or missing timber members and a significant amount of the rock fill was also missing. The earth fill downstream of the weir on both sides of the weir section has trees growing in it with trunks more than 2 feet in diameter and over 50 feet tall.

#### 4.3 Maintenance of Operating Facilities

The maintenance of the timber reservoir drain gate and sluiceway is the responsibility of the Bear Creek Association. Further discussion of the maintenance of the timber reservoir drain gate and sluiceway is covered in Section 2.3.

#### 4.4 Warning System in Effect

There is no evidence that a formal warning system or procedures to be followed during periods of exceedingly heavy rainfall is in effect.

#### 4.5 Evaluation

The operation and maintenance procedures appear to be marginal for the Bear Creek Lake Dam. An operation and maintenance checklist should be developed and implemented by the owner.

A formal warning system should be implemented because of the probability of loss of life and extensive property damage downstream in the event of a failure of the dam.

The dam is accessible under all weather conditions for inspection and emergency action.



## SECTION 5

### HYDRAULICS AND HYDROLOGY

#### 5.1 Evaluation of Features

a. Design Data. There is no original design information. Bear Creek Lake Dam's watershed is about 10 miles long and averages about 3.5 miles wide, with a total drainage area of 35.2 square miles. Ground elevations range from 2260 to 1521. The slopes of the watershed adjacent to the reservoir vary between 10 and 30 percent. The watershed is nearly 100 percent wooded. The runoff characteristics of the watershed may undergo change in the future as a result of development.

The spillway is capable of handling a discharge of 2,790 cfs. However, the Spillway Design Flood (SDF) for this "Small" size dam with a "High" hazard classification is a minimum of 50 percent of the PMF which has a peak inflow of 13,400 cfs. and a peak outflow of 13,270 cfs. The 50 percent PMF hydrograph was routed through the reservoir with the starting water surface elevation at the crest of the drop spillway, Elev. 1521.0. The maximum water surface elevation in the reservoir resulting from the 50 percent PMF routing would be 6.6 feet above the drop spillway crest and 3.6 feet above the top of the dam.

For further information refer to the computations, data, and printouts included in Appendix C.

b. Experience Data. There is no evidence that rainfall or water level records are kept for this dam.

c. Visual Observations. On the day of the inspection, there were no indications that the drop spillway could be obstructed. The inoperable (boarded up) reservoir drain system could present a serious problem should a draw down of the reservoir be required. Further observations are given in Appendix B.

d. Overtopping Potential. The SDF, for this "Small" size "High" hazard structure is a minimum of 50 percent of the PMF. Based on the hydrologic and hydraulic analysis, the spillway is capable of discharging 11 percent of the PMF without overtopping of the embankment (see Appendix C for computations).

e. Spillway Adequacy. A dam break analysis was performed to evaluate the "hazard to loss of life downstream from the dam, from that which would exist just before overtopping failure" (ETL 1110-2-234, 10 May, 1978). According to the analysis, failure of the Bear Creek Lake Dam would increase the depth of overbank flow from 4.3 feet to 6.7 feet during the occurrence of a 25 percent PMF. The peak discharge at the hazard area would increase from 6,580 cfs. to 11,520 cfs. Failure of the dam is considered to significantly increase the hazard to loss of life. Therefore, the spillway of the Bear Creek Lake Dam is classified as "seriously inadequate."



SECTION 6  
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The dam shows no visible signs of instability. According to the sketch in Appendix E, Plate 2, all sections through the rock filled timber crib portion of the dam have a base width to height of dam ratio of at least 4 to 1. There are many missing and rotten timbers along with a considerable amount of rock fill missing from the rock filled timber cribs. The earth fill downstream of the weir on both sides of the weir section has trees growing in it with trunks more than 2 feet in diameter and over 50 feet tall.

b. Design and Construction Data. There are no design and construction data available. It is not known when the dam was designed and constructed.

c. Operating Records. There is no evidence that operating records are maintained for this structure.

d. Post-Construction Changes. Since there are no records of the original design and construction, there is no way of knowing what constituted the original structure. From the DER files, information is available on maintenance repair work done on the dam through the years, which consisted primarily of repairing the decking & cribbing and replacing rock fill in the cribs.

e. Seismic Stability. Bear Creek Lake Dam is located in Seismic Zone 1 of the "Seismic Zone Map of Contiguous States." Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected Zone 1 earthquake conditions.

## SECTION 7

### ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

#### 7.1 Dam Assessment

a. Evaluation. Based on visual observations made during the date of the inspection, the dam is considered to be in fair condition. The rock filled timber crib portion of the dam has many rotten or missing timbers and significant rock fill is missing. The earth fill downstream of the weir on both sides of the weir section has trees growing in it with trunks more than two feet in diameter and over 50 feet tall. The sluiceway outlet is boarded up, which indicates that the timber gate may be inoperable.

The SDF is a minimum of 50 percent of the PMF. Examination of the results of the hydrologic and hydraulic analysis indicate that the drop spillway is capable of passing 11 percent of the PMF without overtopping of the embankment. Failure of the dam would significantly increase the hazard to loss of life downstream of the dam. Therefore, the capacity of the drop spillway is classified as "seriously inadequate." The dam is considered to be "unsafe (non-emergency)".

b. Adequacy. Although design and construction information is minimal, a phase I evaluation is considered reasonable based on the revealing conditions observed during the field inspection.

c. Urgency. The remedial measures recommended in section 7.2 should be effected immediately.

d. Necessity for further Evaluation. Further detailed hydrologic and hydraulic studies should be made to determine the necessity to increase the size of the spillway.

#### 7.2 Recommendations and Remedial Measures

##### a. Facilities

1. The underwater areas of the cribbing should be investigated by a diver to determine if additional remedial work is necessary.
2. The capacity of the spillway should be increased in accordance with the results of detailed hydrologic and hydraulic studies.
3. Missing and rotten timbers should be replaced immediately.
4. Missing rock fill in the timber cribs should be replaced immediately.
5. The trees in the earth fill portion of the dam should be removed immediately and the embankment area where the trees have been removed should be backfilled and regraded.
6. The reservoir drain system should be made operable. Access should be provided to the sluice gate hoist.

b. Operation and Maintenance Procedures

1. A downstream warning system should be developed, and during periods of heavy rainfall, the dam should be monitored and downstream residents alerted in the event of an impending failure.
2. The owner should develop and implement a maintenance and inspection checklist to insure that all items are maintained on a regular basis.

APPENDIX

A

Check List Engineering Data  
Design, Construction, Operation  
Phase I



NAME OF DAM Bear Creek Lake Dam  
 ID # PA 00545

CHECK LIST  
 ENGINEERING DATA  
 DESIGN, CONSTRUCTION, OPERATION  
 PHASE I

Sheet 1 of 4

REMARKS  
 "As-Built" drawing. The only drawing  
 there are no As-Built drawings. The only drawing  
 in the DER files is a sheet of sketches of the dam  
 done in 1957

Refer to Appendix E, Plate 1

It is unknown when the dam was built. There is  
 documentation of repairs made through the years since 1915

Refer to Appendix E, Plate 2

Refer to Appendix E, Plate 2

None available  
 None available

ITEM

AS-BUILT DRAWINGS

REGIONAL VICINITY MAP

CONSTRUCTION HISTORY

TYPICAL SECTIONS OF DAM

OUTLETS - PLAN

DETAILS

CONSTRAINTS

DISCHARGE RATINGS

RAINFALL/RESERVOIR RECORDS

ITEM	REMARKS
DESIGN REPORTS	No design data available. A sheet of sketches of the dam done in 1957 is the only thing resembling design information available from the DER files
GEOLOGY REPORTS	None provided in DER files. Refer to Appendix F of this report.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No data available No data available No data available No data available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	No information available
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	there is no record of where borrow material came from.

ITEM	REMARKS
------	---------

MONITORING SYSTEMS

None

MODIFICATIONS

The only modification noted from pictures & correspondence through the years (from DER files), was the removal of the rustic footbridge (directly over the dam) in 1933.

HIGH POOL RECORDS

None available

POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS

None

PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS

None

MAINTENANCE OPERATION RECORDS

Correspondence through the years (from DER files) gives information about periodic maintenance work that was done. There are no operating records available.



ITEM	REMARKS
SPILLWAY PLAN	Refer to Appendix E for details
SECTIONS	
DETAILS	

OPERATING EQUIPMENT  
PLANS & DETAILS

No information available

MISCELLANEOUS

Material in DER files

1. Dam inspection reports through the years.
2. Photographs made in 1915 and through the intervening years.
3. Four "Applications for Permit to Draw Dam or other Body of Water"
4. Corps of Engineers, U.S. Army, Phila. Dist., "Disaster Work Survey Form" Aug 1955
5. Miscellaneous correspondence.
6. Two rough sketches with conflicting information. One dated 8/57 and the other one undated.

CHECK LIST  
VISUAL INSPECTION  
PHASE I

Sheet 1 of 11

Name Dam Bear Creek Lake Dam County LuZerne State Pennsylvania National ID # PA 00545  
Type of Dam Rock Filled Timber Crib Hazard Category High  
Date(s) Inspection Dec. 14, 1978 Weather Cloudy, cold Temperature ≈ 20°F

Pool Elevation at Time of Inspection 1521 ± M.S.L. Tailwater at Time of Inspection 1508 ± M.S.L.

Inspection Personnel:

George C. Elias David B. Campbell Leonard R. Beck

Leonard R. Beck Recorder

Remarks:

We were not successful in contacting anyone associated with the dam.

Rock Filled  
Timber Crib  
CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	At various points along the timber headwall	Replace timbers which are missing or rotten along the headwall
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	The earth fill downstream of the weir on both sides of the weir section has trees growing in it with trunks more than 2 feet in diameter and over 50 feet tall	Trees should be removed & embankment should be repaired.
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	From what could be observed immediately downstream of the dam, it appears the foundation is bedrock	None



*Rock Filled  
Timber Crib  
CONCRETE/MASONRY DAMS*

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SURFACE CRACKS  
CONCRETE SURFACES

*N/A*

STRUCTURAL CRACKING

*There are many missing  
& rotten timbers*

*Replace rotten  
and missing timbers.  
Replace rock in cribbing.*

VERTICAL AND HORIZONTAL  
ALIGNMENT

*Vertical headwall timbers  
are out of alignment*

*Replace and/or realign  
vertical headwall  
timbers where needed.*

MONOLITH JOINTS

*N/A*

CONSTRUCTION JOINTS

*N/A*

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Only as associated with large trees in the embankment portion of the dam	Remove trees and repair the embankment where the trees are removed
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None Observed	None
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None Observed	None
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No problem	None
RIPRAP FAILURES	None Observed	None

EMBANKMENT

Sheet 5 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	See observations on Sk 2/11 "structure to Abutment/ Embankment junctions"	
---	---	--

ANY NOTICEABLE SEEPAGE	None noticed through the embankment	None
------------------------	---	------

STAFF GAGE AND RECORDER	None	None
-------------------------	------	------

DRAINS	None Observed	None
--------	---------------	------



OUTLET WORKS

Sheet 6 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

CRACKING AND SPALLING OF  
CONCRETE SURFACES IN  
OUTLET CONDUIT

N/A

INTAKE STRUCTURE

Under water & could  
not be observed

could only be  
observed if lake is  
drawn down

OUTLET STRUCTURE

Boarded up.

Should be opened up.

OUTLET CHANNEL

It is a flat bottomed creek  
channel about 150 feet wide  
at the dam which narrows  
down to about 45 feet wide  
at the state highway bridge (down stream)

No respiration  
to flow from  
reservoir drain

EMERGENCY GATE

Timber gate is not  
known if it is  
operable

could only be  
observed if lake  
is drawn down

UNGATED SPILLWAY

Sheet 7 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR timber	There are some missing and rotten timber	Replace the missing and rotten timbers.
APPROACH CHANNEL	There appears to be no obstructions	None
DISCHARGE CHANNEL	Refer to observations sk 6/11 "Outlet channel"	State highway 115 bridge could be an obstruction for higher flows
BRIDGE AND PIERS		N/A

GATED SPILLWAY

Sheet 8 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	



INSTRUMENTATION

Sheet 9 of 11

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	None
OBSERVATION WELLS	None	None
WEIRS	None	None
PIEZOMETERS	None	None
OTHER	None	None

RESERVOIR

Sheet 10 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

SLOPES

The slopes on the perimeter of the reservoir which range from mild (less than 10%) to steep (greater than 30%) are almost entirely timber covered.

None.

SEDIMENTATION

Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability, or other features that would significantly affect the storage capacity of the reservoir.

None.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Approximately 200 feet downstream of the dam Bear Creek flows through the state route 115 bridge. The bridge opening is about 10 feet high and 45 feet wide. About 5.5 miles downstream from Bear Creek Lake are the headwaters of F. E. Walters reservoir (C. of E.)	Route 115 bridge may be a problem for higher discharges
SLOPES	The channel gradient averages about 0.4% for the entire 5.5 miles from Bear Creek Lake Dam to the headwaters of F. E. Walters reservoir (C. of E.)	None
APPROXIMATE NO. OF HOMES AND POPULATION	There are 8 homes and approximately 40 people	A formal warning system should be developed and implemented Procedures for evacuating people within the potential flood area should be implemented



APPENDIX

C

Hydrologic & Hydraulic Data

## Table of Contents APPENDIX C

### Hydrologic & Hydraulic Data

<i>DMP Calculations</i>	<i>Sheet 1</i>
<i>Snyder Coefficients</i>	<i>" 1</i>
<i>Spillway Discharge</i>	<i>" 2</i>
<i>Stage - storage</i>	<i>" 2</i>
<i>Discharge Through Timber Sluice Gate</i>	<i>" 3</i>
<i>Cross Section @ First Home Downstream</i>	<i>" 4</i>
<i>HEC-I Dam Safety Version Computer</i>	
<i>Output Without Breach of Dam</i>	<i>" 5-9</i>
<i>HEC-I Dam Safety Version Computer</i>	
<i>Output With Breach of Dam</i>	<i>" 10-16</i>



O'BRIEN & GERE

SUBJECT

BEAR CREEK DAM

SHEET

1

BY

RRB

DATE

2/14/79

JOB NO.

✓ 2/14/79

HYDRO. CALCS. FOR HEC-1 PROGRAM

DRAINAGE AREA: 35.2 SQUARE MILES

PMP CALCULATIONS (HMS REPORT 33)

AREA IS IN ZONE 1

24 HR., 200 SQ. MI. RAINFALL = 22"

<u>HR.</u>	<u>%</u>	<u>RAINFALL</u>	<u>DRF</u>
6	97	21.3"	21.3"
12	110	24.2"	2.9"
24	120	26.4"	2.2"
48	128	28.2"	1.8"

SNYDER COEFFICIENTS

FROM INFO. PROVIDED BY COE,  
FOR ZONE 2 IN THE LEHIGH RIVER BASIN:

$$C_p = 0.45$$

AND

$$C_t = 2.1$$

$$t_p = C_t (L \cdot L_{ca})^{0.3}$$

$$L \approx 9.9 \text{ miles}$$

$$L_{ca} \approx 5.5 \text{ miles}$$

$$t_p = 2.1 (9.9 \cdot 5.5)^{0.3} = 6.97 \text{ HRS.}$$



SUBJECT

SHEET

BY

DATE

JOB NO.

2

RRB

2/11/79

### SPILLWAY DISCHARGE

$$Q = CLH^{3/2}$$

SPILLWAY CREST ELEVATION @ 1521.0

$$C = 3.4 \left\{ \begin{array}{l} \text{Refer to Sk 4} \\ \text{Report upon} \\ \text{the No. 1} \\ \text{Dam of the} \\ \text{Bear Cr. Inc. Co.} \\ \text{4/30/15} \end{array} \right.$$

 $L = 158 \text{ FT. (refer to sketch of dam)}$   
8/57

$$Q = 537.2 H^{3/2}$$

<u>STAGE</u>	<u>H (FT.)</u>	<u>SP. DISCHARGE (Q) (CFS)</u>
1521	0	0
1521.5	0.5	190
1522	1	537
1522.5	1.5	987
1523	2	1519
1523.5	2.5	2123
1524	3	2791
1525	4	4298
1530	9	14504
1540	19	44490

### STAGE - STORAGE

<u>STAGE</u>	<u>Surface Area (Ac.)</u>	<u>STORAGE (AC.-FT.)</u>
1512	0	0
1521	80	490
1524	103	765
1540	215	4109

SUBJECT	SHEET	BY	DATE	JOB NO.
Bear Creek Lake Dam	3	J	1/30/79	

Discharge Through Timber Sluice Gate (If Operable)

orifice  $\left\{ \begin{array}{l} A = 6' \text{ high} \times 8' \text{ wide (scaled from picture taken 6/65)} \\ C_o = 0.6 \\ Q = C A \sqrt{2gH} \text{ (orifice flow)} \end{array} \right.$

Weir  $\left\{ \begin{array}{l} L = 8' \\ C_{w1} = 3.1 \\ Q = C L H^{3/2} \end{array} \right.$

Elev.	sq. edged weir @ El. 1512.5 $C L = 24.8$	orifice @ sluice gate @ El. 1515.5 $C A \sqrt{2g} = 231.1$
1512.5	0	0
1514.0	46	0
1515.5	129	0
1516.5	198	231
1517.5	277	327
1518.5	364	400
1519.5	459	462
1521.0	615	542
1522.5	784	611
1524.0 Top of Dam		674

approx. 4 ft.  
when control switches  
weir to orifice



O'BRIEN & GERE

SUBJECT

BEAR CREEK DAM

SHEET

4

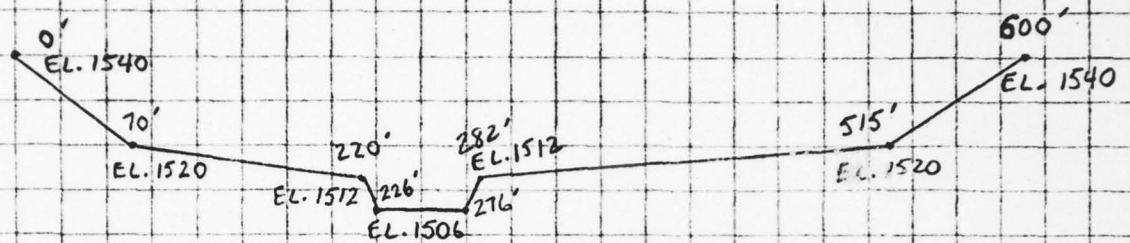
BY

RRB

DATE

JOB NO.

CROSS-SECTION AT FIRST HOME DOWNSTREAM





.....  
 FLOOD HYDROGRAPH PACKAGE (HFC-1)  
 DA- SAFETY VERSION JULY 1974  
 LAST MODIFICATION 25 SEP 78  
 .....

NATIONAL DAM INSPECTION PROGRAM									
	BEAR CREEK DAM		PMF HYDROGRAPH		BEAR CREEK DAM		PMF HYDROGRAPH		
1	A1	1	0	0	0	0	0	0	0
2	A2	1	0	0	0	0	0	0	0
3	A3	300	1	0	0	0	0	0	0
4	A4	5	1	0	0	0	0	0	0
5	B1	1	9	0	0	0	0	0	0
6	J1	.05	.10	.15	.20	.30	.40	.50	1.00
7	K1	0	A1	35.2	110	120	128	1	1
8	M1	1	1	47	110	120	128	1.0	0.05
9	P1	0	22	2	1	1	1	1	1
10	T1	6.97	0.45	ROUTING THROUGH BEAR CREEK LAKE	1	1	1	1	1
11	X1	-1.5	-0.05	1	1	1	1	1	1
12	X2	1	A2	1	1	1	1	1	1
13	K1	1	1	1	1	1	1	1	1
14	K2	1	1	1	1	1	1	1	1
15	K3	1	1	1	1	1	1	1	1
16	K4	1	1	1	1	1	1	1	1
17	K5	1	1	1	1	1	1	1	1
18	K6	1	1	1	1	1	1	1	1
19	K7	1	1	1	1	1	1	1	1
20	K8	1	1	1	1	1	1	1	1
21	K9	1	1	1	1	1	1	1	1
22	K10	1	1	1	1	1	1	1	1
23	K11	1	1	1	1	1	1	1	1
24	K12	1	1	1	1	1	1	1	1
25	K13	1	1	1	1	1	1	1	1

Sh 5

\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 25 SEP 78  
 \*\*\*\*\*

RUN DATE 02/22/79.  
 TIME 14.32.30.

SH 6

NATIONAL DAM INSPECTION PROGRAM  
 BEAR CREEK DAM  
 PMF HYDROGRAPH

JOB SPECIFICATION									
NQ	NHR	NMIN	IDAY	IMR	IMIN	METRC	IPLT	IPRT	NSTAN
300	1	0	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= .05 .10 .15 .20 .30 .40 .50 .75 1.00  
 NPLAN= 1 NRTIO= 9 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

RUNOFF TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPT	JPLT	JPRI	INAME	ISTAGE	IAUTO
A1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INVDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	35.20	0.00	35.20	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	97.00	110.00	120.00	128.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .840

LOSS DATA										
LROPT	STMR	DLTKR	RTIOL	ERAIN	STPKS	RTIOK	STRTL	CHSTL	ALSNX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA  
 TP= 6.97 CP= .45 NTA= 0

RECESSION DATA

STRTO= -1.50 GRCSV= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 63 END-OF-PERIOD ORIGINATES, LAG= 7.02 HOURS, CP= .45 VOL= 1.00									
MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP 0	MO.DA	HR.MN	PERIOD
69.	259.	527.	837.	1133.	1355.	1478.	1465.	598.	240.
1130.	1032.	942.	860.	785.	717.	654.	546.	220.	200.
455.	415.	379.	346.	313.	288.	263.	240.	220.	200.
183.	167.	153.	139.	127.	116.	106.	97.	88.	81.
74.	67.	61.	56.	51.	47.	43.	39.	36.	32.
30.	27.	25.	23.	21.	19.	17.	16.	14.	13.
12.	11.	10.							

MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP 0

SUM 23.65 21.27 2.30 488167.  
 ( 601.1) ( 540.1) ( 61.1) (13823.35)

Sh 7

.....

HYDROGRAPH ROUTING

ROUTING THROUGH BEAR CREEK LAKE

ISTAQ ICOMP IECON ITEMP JPLT JPRT INAME ISTAGE IAUO  
A2 1 0 0 0 0 0 0 0  
ROUTING DATA  
QLOSS CLOSS AVG IRES ISAMP IOPT IPMP LSTR  
0.0 0.000 0.00 1 1 0 0 0  
NSTPS NSTOL LAG AMSKA X TSM STORA ISPRAT  
1 0 0 0.000 0.000 -1. -1

STAGE 1521.00 1521.50 1522.00 1522.50 1523.00 1523.50 1524.00 1525.00 1530.00 1540.00  
FLOW 0.00 190.00 537.00 987.00 1519.00 2123.00 2791.00 4298.00 14504.00 44490.00  
CAPACITY= 0. 490. 765. 4109.  
ELEVATION= 1512. 1521. 1524. 1540.

CHEL SPWID COOW EXPW ELEV COOL CAREA EXPL  
1521.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA  
TOPEL COOD EXPD DAMWID  
1524.0 3.1 1.5 167.

PEAK OUTFLOW IS 1194. AT TIME 49.00 HOURS

PEAK OUTFLOW IS 2622. AT TIME 47.00 HOURS

PEAK OUTFLOW IS 3880. AT TIME 48.00 HOURS

PEAK OUTFLOW IS 5215. AT TIME 47.00 HOURS

PEAK OUTFLOW IS 7919. AT TIME 47.00 HOURS

PEAK OUTFLOW IS 10592. AT TIME 47.00 HOURS

PEAK OUTFLOW IS 13265. AT TIME 47.00 HOURS

PEAK OUTFLOW IS 19954. AT TIME 47.00 HOURS

ITERATIVE SOLUTION DID NOT CONVERGE 49 1 0.000 1.530E+03 -2.001E+03 1.530E+03 3.329E+03

PEAK OUTFLOW IS 26716. AT TIME 47.00 HOURS



SH 8

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SFCOND (CUBIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				.05	.10	.15	.20	.30	.40	.50	.75	1.00
HYDROGRAPH AT	A1	35.20	1	1340.	2681.	4021.	5361.	8042.	10723.	13403.	20105.	26807.
	(	91.17)	(	37.95)	75.91)	113.86)	151.82)	227.73)	303.63)	379.54)	569.31)	759.09)
ROUTED TO	A2	35.20	1	1194.	2622.	3880.	5215.	7919.	10592.	13265.	19954.	26716.
	(	91.17)	(	33.81)	74.23)	109.88)	147.68)	224.25)	299.93)	375.62)	565.05)	756.52)

# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

ELEVATION  
STORAGE  
OUTFLOW

INITIAL VALUE  
1512.00  
0.  
0.

SPILLWAY CREST  
1521.00  
490.  
0.

TOP OF DAM  
1524.00  
765.  
2791.

RATIO  
OF  
PMF

MAXIMUM  
RESERVOIR  
W.S.ELEV

MAXIMUM  
DEPTH  
OVER DAM

MAXIMUM  
STORAGE  
AC-FT

MAXIMUM  
OUTFLOW  
CFS

DURATION  
OVER TOP  
HOURS

TIME OF  
MAX OUTFLOW  
HOURS

TIME OF  
FAILURE  
HOURS

SH 9

1522.69  
1523.87  
1524.57  
1525.14  
1526.04  
1526.86  
1527.64  
1529.45  
1530.31

0.00  
0.00  
.57  
1.14  
2.04  
2.86  
3.64  
5.45  
6.31

645.  
753.  
885.  
1003.  
1191.  
1362.  
1525.  
1903.  
2083.

1194.  
2622.  
3880.  
5215.  
7919.  
10592.  
13265.  
19954.  
26716.

0.00  
0.00  
9.00  
14.00  
20.00  
24.00  
26.00  
33.00  
37.00

49.00  
47.00  
48.00  
47.00  
47.00  
47.00  
47.00  
47.00  
47.00

0.00  
0.00  
0.00  
0.00  
0.00  
0.00  
0.00  
0.00  
0.00





FF 45

RUN DATE= 02/23/74.  
TIME= 0 15.20.30.

NATIONAL DAM INSPECTION PROGRAM  
HEAR CREEK DAM  
PMF HYDROGRAPH

JOB SPECIFICATION									
NO	NH#	NMIN	IDAY	IHR	IMIN	METAC	IPLT	IPRT	NSTAN
300	1	0	0	0	0	0	0	-6	0
			JOPTR	NWT	LKONT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED  
NPLAN= 2 NRTIO= 1 LRTIO= 1

47105 = 50114 .25

## SUB-AREA RUNOFF COMPUTATION

TURNOFF TO RESE-4VOI4

ISTAD	ICOMP	IECON	IIAPP	JPLT	JHMT	INAME	ISTAGE	IAUTO
AI	0	0	0	0	0	1	0	0

IMPRIS	IMUG	TANCA	SNAP	THSDA	IN-SPC	RATIO	ISNOW	ISAME	LOCAL
1	1	35.00	0.00	35.20	0.00	0.000	0	1	0

PRECIP DATA

TRANC COMPUTED BY THE PROGRAM IS .440  
22.0  
0.00  
SAFE  
345

LNUPT	LOSS DATA									
	STMR	DLTKM	MTIOL	ERAIN	STKKS	MTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA  
TP= 6.47 C2= .45 NTA= 0

RECESSION DATA  
 STATION = -1.50      QRC51 = -.05      RTION = 2.00

UNIT	HYDROGRAPH	6.3	END-OF-PERIOD	ORDINATES,	LAG,	7.02	HOURS,	CP,	.45	VOL,	1.00
69.	259.	527.	937.	1135.	1478.	1465.	1356.	1238.			
130.	1032.	942.	785.	717.	654.	598.	546.	498.			
155.	415.	374.	366.	288.	263.	245.	220.	200.			
183.	167.	153.	139.	116.	106.	97.	88.	81.			
194.	67.	61.	56.	51.	47.	43.	36.	32.			
205.	27.	25.	23.	21.	19.	16.	14.	13.			
216.	11.	10.	12.								

MO,DA	TR,MM	PERIOD	MAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	TR,MM	PERIOD	RAIN	EXCS	LOSS	COMP Q
								SUM	23.65	21.27	2.39	488167.
									( 601.11540.1)	( 61.113823.35)		

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# HYDROGRAPH ROUTING

ROUTING THROUGH NEAR LOWER LAKE

ISTAU	ICOMP	IECON	ITIME	JPLT	JHRT	INAME	ISTAGE	IAUTO
AZ	1	0	0	0	0	1	0	0

ALL PLANS MAY BE SAME

ROUTING DATA

WLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IMP	LSTR
0.0	0.00	0.00	1	1	0	0	0

NSTPS	ISTDL	LAG	AKSKA	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	-1

STAGE	1521.00	1521.50	1522.00	1522.50	1523.00	1523.50	1524.00	1525.00	1530.00	1540.00
FLOW	0.00	130.00	537.00	987.00	1519.00	2123.00	2791.00	4298.00	14504.00	44490.00

4104.

765.

1540.

1512.

CRCL	SPWID	COOW	EXPW	ELEVEL	COOL	CAREA	EXPL
1521.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOPEL	COGJ	EXPD	DAMWID
1524.0	3.1	1.5	167.

DAM BREACH DATA

HMID	Z	ELH	TFAIL	WSEL	FAILEL
159.	0.00	1512.00	2.00	1521.00	1550.00

PEAK OUTFLOW IS 6580. AT TIME 47.00 HOURS

DAM BREACH DATA

HMID	Z	ELH	TFAIL	WSEL	FAILEL
158.	0.00	1512.00	2.00	1521.00	1525.00

BEGIN DAM FAILURE AT 45.00 HOURS

PEAK OUTFLOW IS 11897. AT TIME 46.20 HOURS

0.25 PMIF with Breach of Dam

SH 12

•OVF•

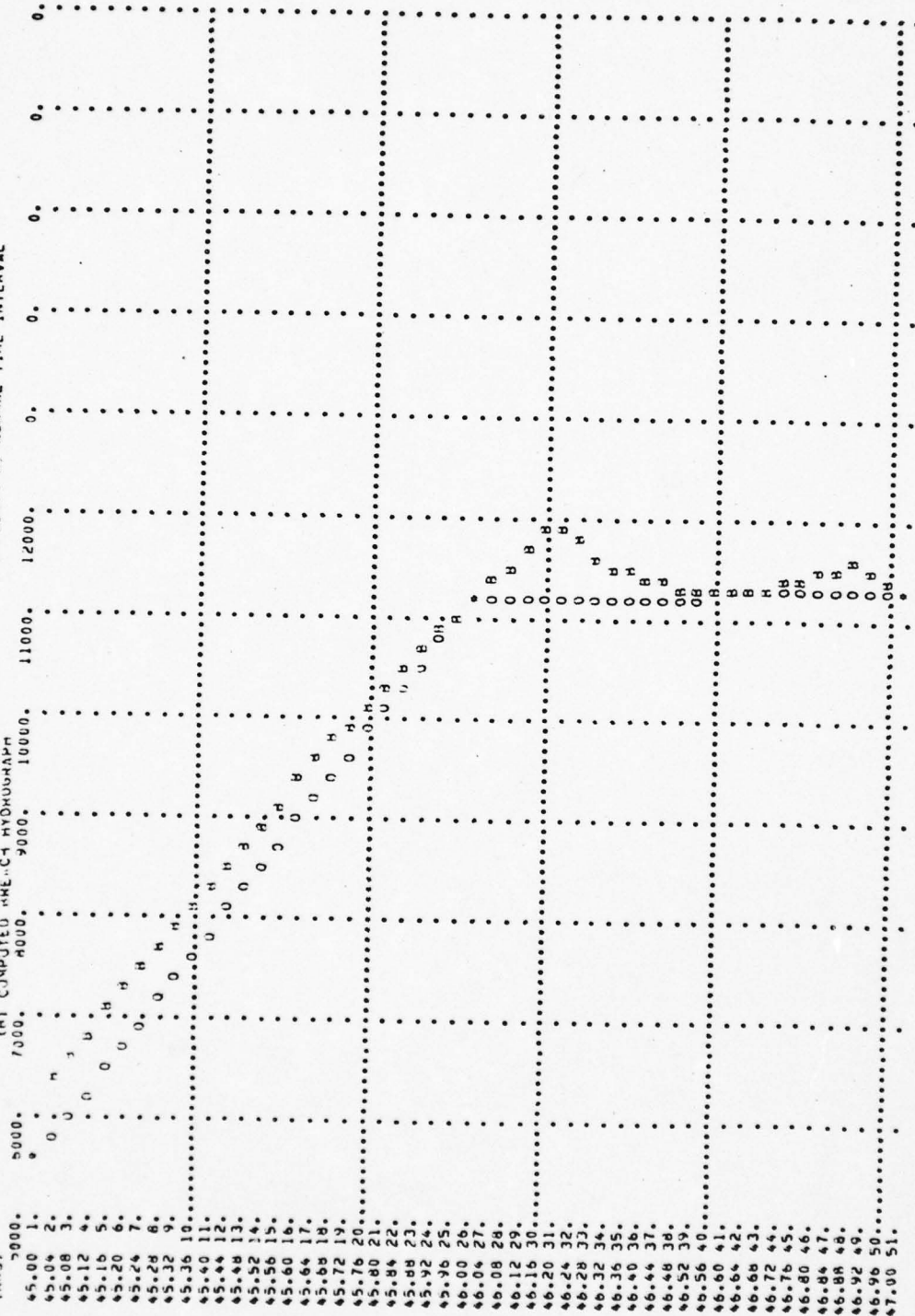
STATION A2

025 PMF with Break of Dam

Sh 13

TIME (H:M)  
(1) INTERPOLATED REACH HYDROGRAPH  
(2) COMPUTED REACH HYDROGRAPH

(\*) POINTS AT NORMAL TIME INTERVAL





0.25 PMF with Breach of Dam  
Sh 14

[illegible]

•••••

0000000000

0000000000

0000000000

HYDROGRAPH ROUTING

ROUTING DOWNSTREAM

ISTAU	ICQ4P	IECON	ITAPP	JPLT	JPRT	INAME	ISTAGE	IAUTO
H1	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME

	IHE\$	ISAMr.	IOPT	IPMP	LSTR
--	-------	--------	------	------	------

CLASS CLASS AVG

INSTPS	INSTOL	LAG	4MSK	X	TSK	STORA	ISPRAY
1	0	0	0.000	0.000	0.000	-1.	0

### NORMAL DEPTH CHANNEL ROUTING

UN(1)	UN(2)	UN(3)	ELNVT	ELMAX	WLNTH	SEL
.0600	.0400	.0600	1506.0	1520.0	600.	.00330

CROSS SECTION COORDINATES--STA, ELEV, STA, ELEV--ETC
0.00 1540.00 70.00 1520.00 220.00 1512.00
202.00 1512.00 515.00 1520.00 600.00 1540.00

	0.00	.51	1.04	1.59	2.15	2.72	3.31	3.92	4.54	5.30
STORAGE	6.41	7.89	9.72	11.91	14.46	17.36	20.62	24.25	28.22	32.56
OUTFLOW	0.00	66.13	203.17	398.76	663.51	933.07	1264.53	1635.86	2045.55	2538.43
	3116.24	3797.60	4603.20	5550.17	6654.99	7932.87	9398.19	11064.71	12945.62	15053.67
STAGE	1506.00	1506.74	1507.47	1508.21	1508.95	1509.68	1510.42	1511.16	1511.89	1512.63
	1513.37	1514.11	1514.84	1515.58	1516.32	1517.05	1517.79	1518.53	1519.26	1520.00
FLOW	0.00	54.13	203.17	398.76	663.51	933.07	1264.53	1635.86	2045.55	2538.43
	3116.24	3797.60	4603.20	5550.17	6654.99	7932.87	9398.19	11064.71	12945.62	15053.67

MAXIMUM STAGE IS 1516.3

MAXIMUM STAGE IS 1518.7

.....

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

*0.25 DMF with  
 Breach of Dam  
 Sh 15*

OPERATION	STATION	AREA	PLAN	RATIO	1
					.25
HYDROGRAPH AT	A1	35.20	1	5702.	
	(	91.17)	(	109,77)	(
	A2	35.20	2	5702.	
	(	91.17)	(	109,77)	(
ROUTED TO	A1	35.20	1	5360.	
	(	91.17)	(	105,33)	(
	A2	35.20	2	11286.	
	(	91.17)	(	119,59)	(
ROUTED TO	H1	35.20	1	6581.	
	(	91.17)	(	105,36)	(
	A2	35.20	2	11525.	
	(	91.17)	(	326,35)	(

# SUMMARY OF DAM SAFETY ANALYSIS

0.25 PMF with  
Breach of Dam  
Sk 46

PLAN 1 .....

RATIO OF PMF	ELEVATION STORAGE OUTFLOW	MAXIMUM DEPTH OVER DAM	INITIAL VALUE	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	1525.00	1.60	1521.00 490. 0.	1100.	6580.	17.00	47.00	0.00

PLAN 2 .....

RATIO OF PMF	ELEVATION STORAGE OUTFLOW	MAXIMUM DEPTH OVER DAM	INITIAL VALUE	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	1525.25	1.25	1521.00 490. 0.	1026.	11897.	4.16	46.20	45.00

PLAN 1 STATION 81

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.25	6581.	1516.3	47.00

PLAN 2 STATION 81

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.25	11825.	1518.7	47.00



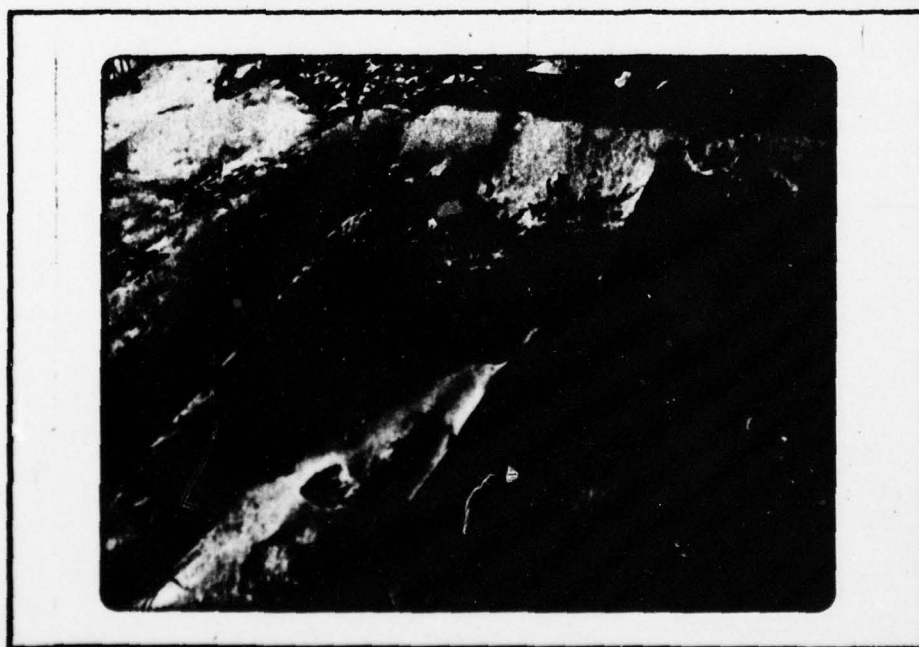
APPENDIX

D

Photographs



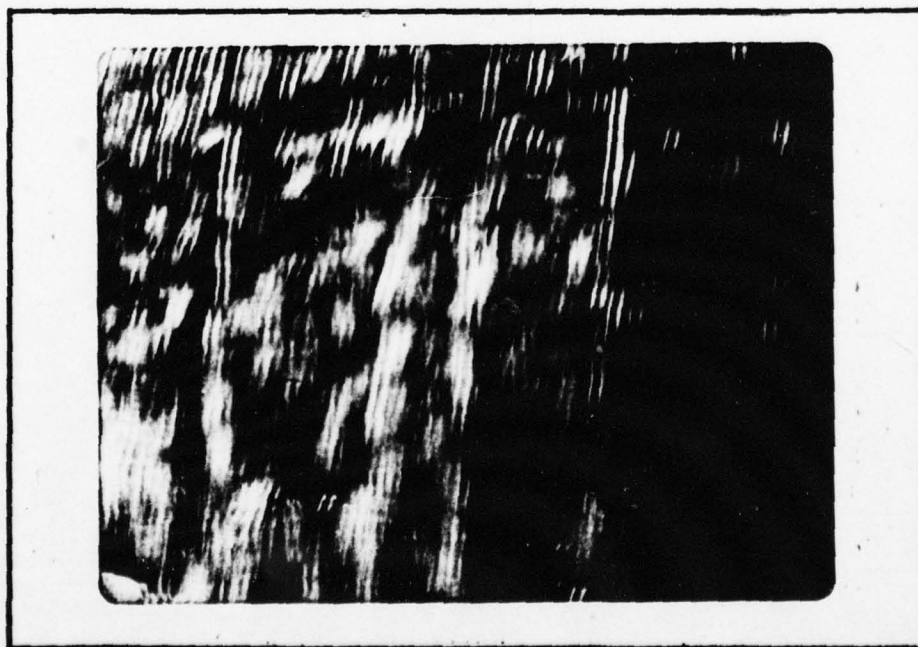
*LEFT ABUTMENT SHOWING SOME TIMBER DETERIORATION*



*CLOSE UP OF TIMBER DETERIORATION  
ON THE RIGHT ABUTMENT*

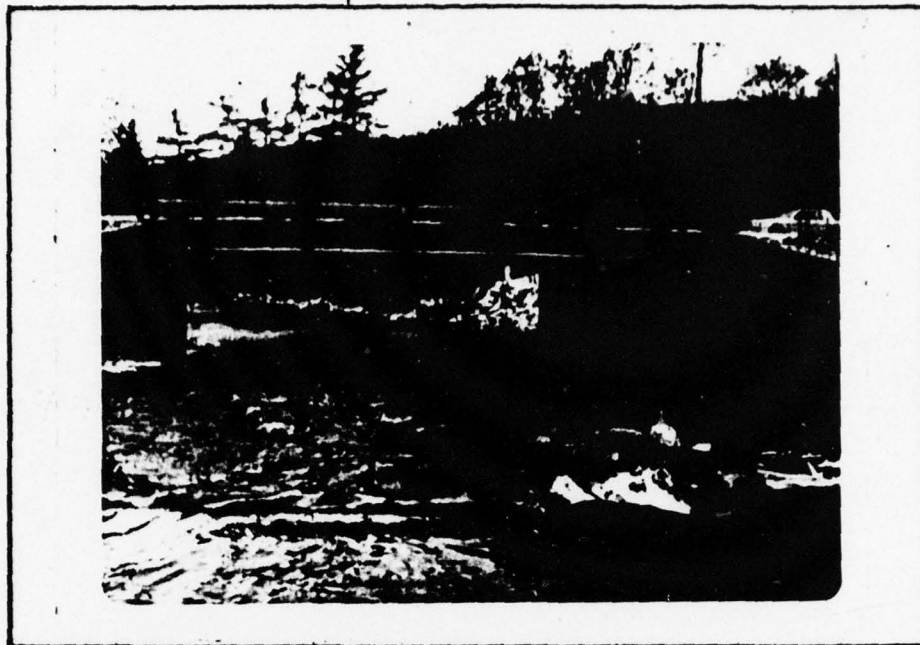


*VIEW OF THE SPILLWAY FROM THE ROUTE 115 BRIDGE*



*VIEW THROUGH THE SPILLWAY FLOW SHOWING  
THE BOARDED UP OUTLET OF THE SLUICeway*





*LOOKING DOWNSTREAM THROUGH THE  
ROUTE 115 BRIDGE FROM THE LEFT ABUTMENT*



*DAMAGE AREA APPROXIMATELY 600 FEET  
DOWNSTREAM FROM THE DAM*

APPENDIX

E

Drawings



O'BRIEN & GERE  
ENGINEERS, INC.

SUBJECT

*Bear Creek Dam*

SHEET

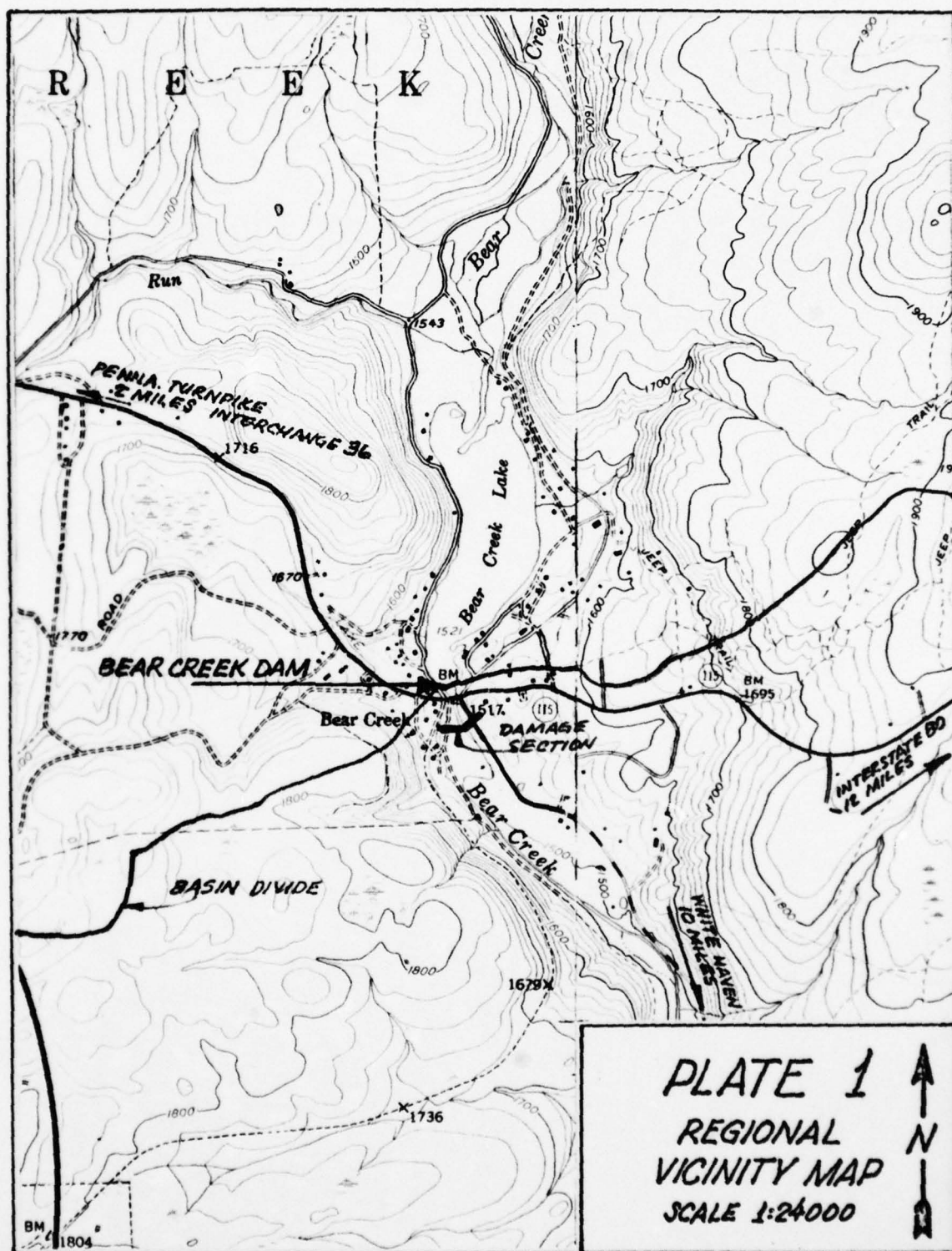
BY

DATE

JOB NO

## TABLE OF CONTENTS APPENDIX E

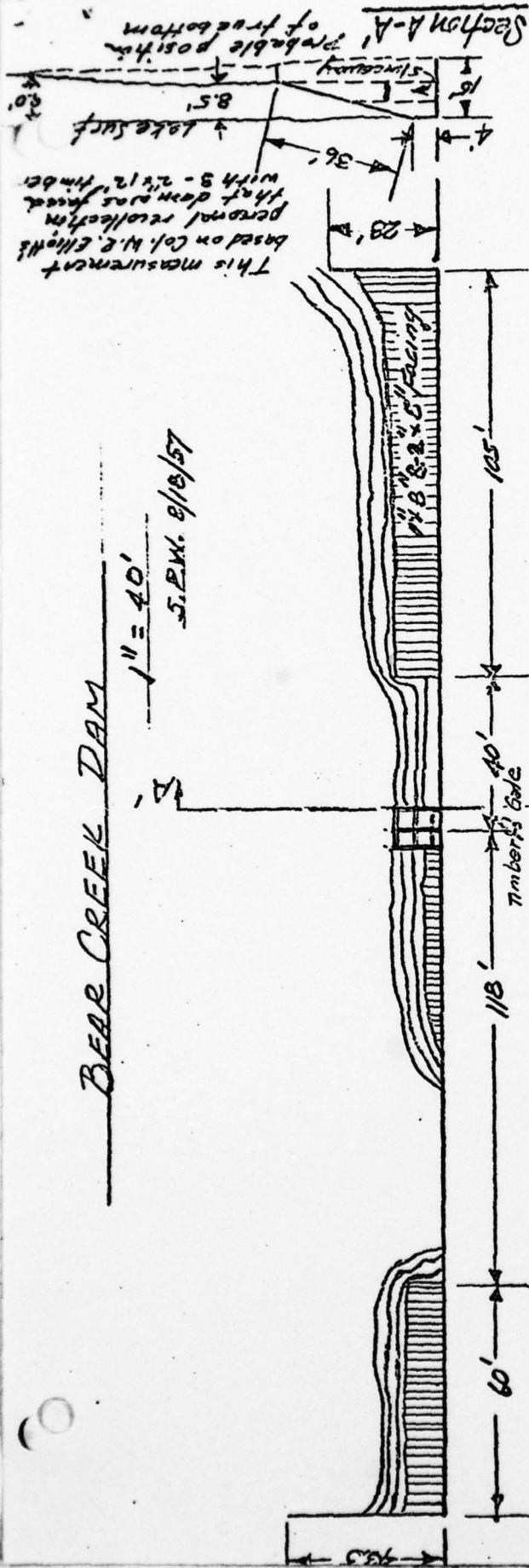
<i>Regional Vicinity Map</i>	<i>Plate 1</i>
<i>Plan &amp; Profile of Dam as of 8/57</i>	<i>" 2</i>
<i>Plan View of Dam with Problems Noted</i>	<i>" 3</i>
<i>Profile of Top of Dam</i>	<i>" 4</i>



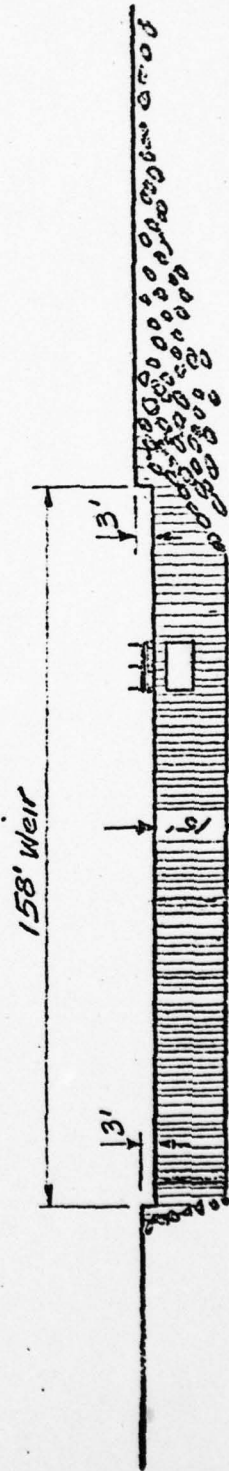


# BEAR CREEK DAM

1" = 40'  
S.P.W. 8/18/57



Dam is of cribbed and rock fill construction.



Sketches of Bear Creek Dam  
as of 8/57  
PLATE #2

SUBJECT

*Bear Creek Lake Dam*

SHEET

BY

*#*

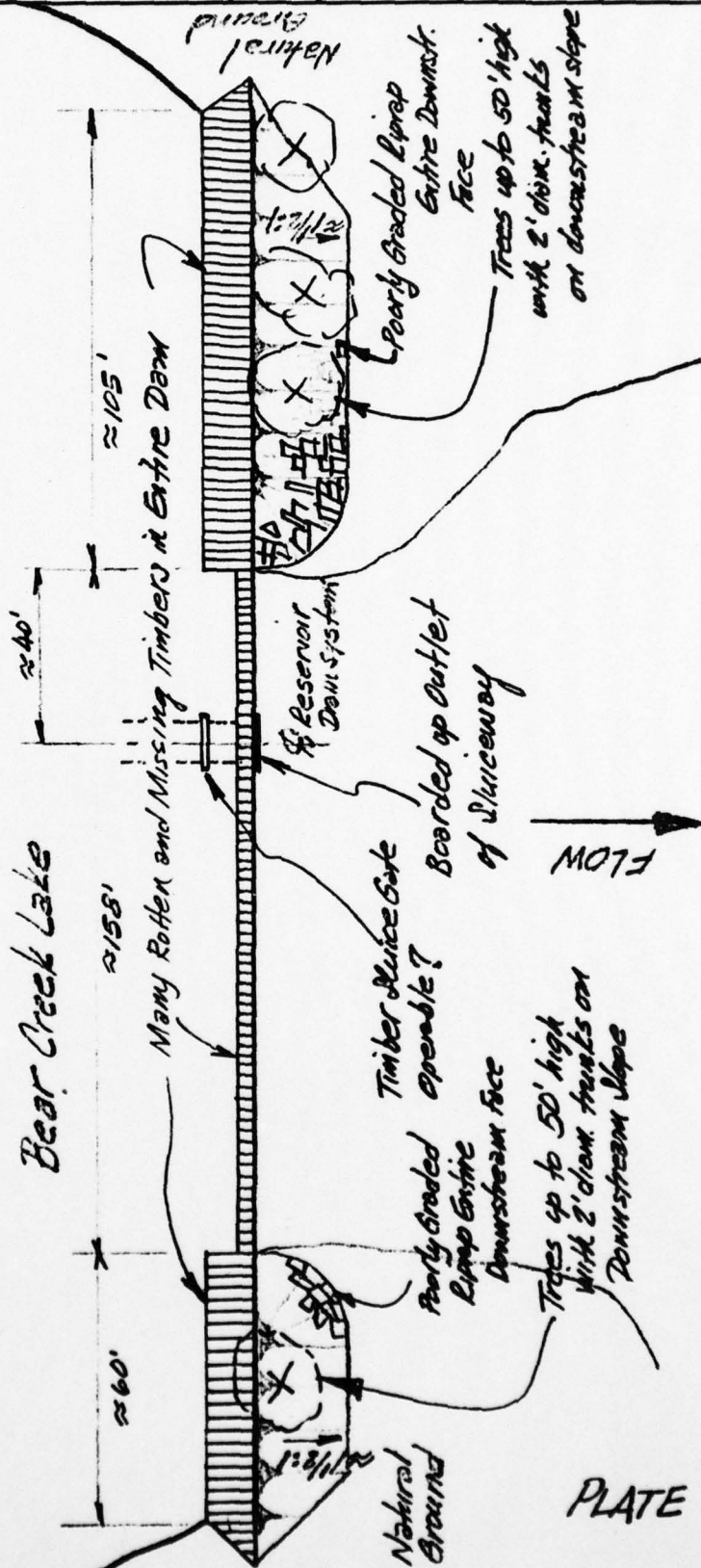
DATE

*2/27/79*

JOB NO

PLAN VIEW BEAR CREEK DAM AS OF 12/14/73

*Dam is of rock filled timber crib construction.*



SUBJECT

*Bear Creek Dam*

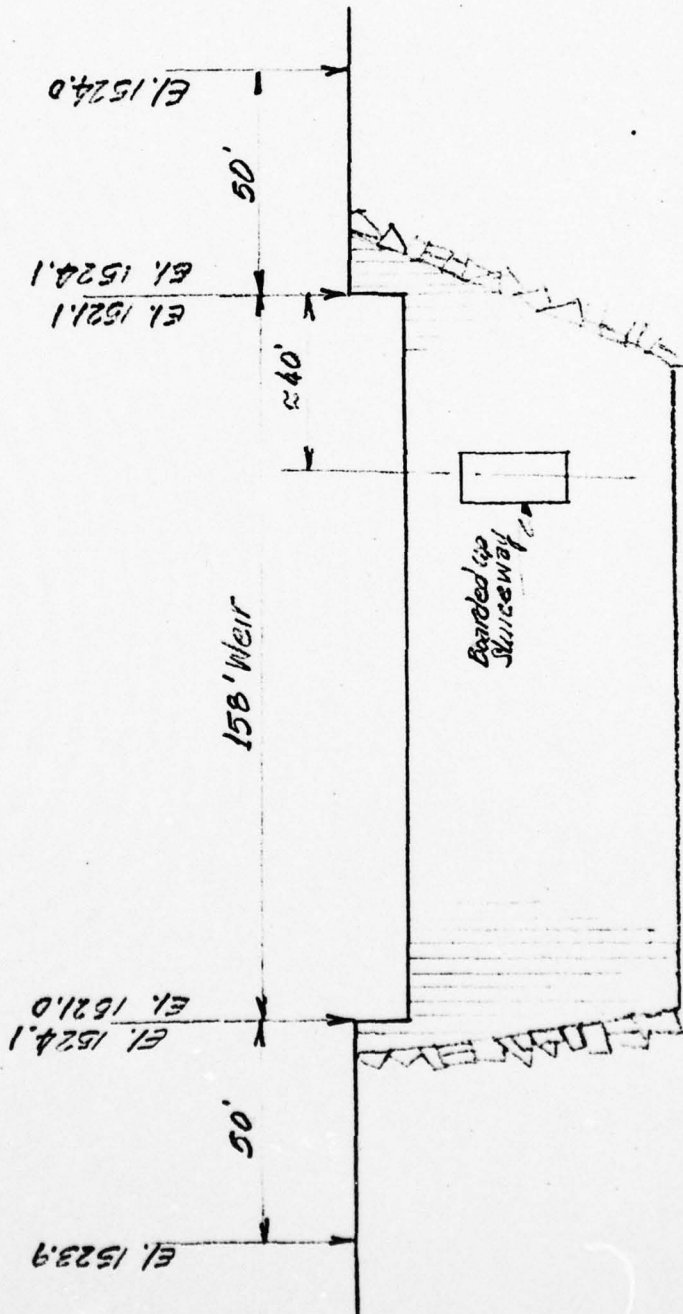
SHEET

BY

DATE

JOB NO

**PLATE 4**



PROFILE OF TOP OF DAM

APPENDIX

F

Site Geology



## SITE GEOLOGY

### Bear Creek Dam

Bear Creek is located in the mountainous region bordering the western edge of the Pocono Plateau section of the Appalachian Plateaus physiographic province and the eastern portion of the Appalachian Mountain section of the Valley and Ridge physiographic province. The site rests on varied deposits of glacial debris underlain by relatively flat lying shale, siltstone and sandstone units of the Devonian Catskill continental group. The Bear Creek valley is incised into these units while coarser clastics of the younger Mississippian Pocono formation form the high and steep valley walls to the creek's confluence with Lehigh River several miles downstream.

Rock structures in the vicinity of the site are relatively simple with no known faults or discontinuities noted in published literature.

